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FOODNET NEWS

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INSIDE THIS ISSUE:

The Incidence of Infection with Pathogens Commonly Transmitted Through Food-10 States, United States , 2007*

FoodNet measures progress in reducing the incidence of nine foodborne infections by comparing current rates to previous years and to Healthy People 2010 objectives. In 2007, a total of 17,878 laboratory-confirmed cases of infection were identified from residents of the FoodNet catchment area. Table 1 lists the number of infections by pathogen, their incidence and corresponding Healthy People 2010 objectives.

FoodNet uses a negative binomial regression model (see a description of this model in the spotlight below) to estimate statistically significant changes in incidence of infections in 2007 compared with previous years and to calculate 95% confidence intervals (CI). The estimated annual incidence of several infections changed significantly when compared with the 1996-1998 period: *Yersinia* decreased 49% (CI = 36% - 59%), *Listeria* decreased 42% (CI = 28% - 54%), *Shigella* decreased 36% (CI = 9% - 55%), *Campylobacter* decreased 31% (CI = 25% - 36%), STEC O157 decreased 25% (CI = 9% - 38%), and *Salmonella* decreased 8% (CI = 2% - 14%). The estimated incidence of *Cryptosporidium* and *Vibrio* infection did not change significantly. However, when 2007 rates were compared with 2004-2006, only *Cryptosporidium* infections increased significantly (44%; CI = 8% - 91%).

These results suggest that while there has been progress towards the 2010 national health objectives, most progress occurred before 2004 and none of the objectives were met in 2007. The greatest area for intervention appears to be in reducing *Salmonella* whose incidence in 2007 was twice the national health objective and only 8% lower than the rate seen in 1996-1998. For further information about trends seen in FoodNet please refer to: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5714a2.htm.

—Olga Henao, CDC FoodNet

TABLE 1. Number and Incidence* of laboratory-confirmed bacterial and parasitic infections in 2007, by site and pathogen, compared with national health objectives† - Foodborne Diseases Active Surveillance Network, United States

Pathogen	Number of cases	Incidence	National health objective†
Bacteria			
Campylobacter	5,816	12.78	12.30
Listeria	122	0.27	0.24
Salmonella	6,787	14.92	6.80
Shigella	2,848	6.26	N/A§
STEC¶O157	545	1.20	1.00
STEC non-O157	260	0.57	N/A
Vibrio	108	0.24	N/A
Yersinia	163	0.36	N/A
Parasites			
Cryptosporidium	1,216	2.67	N/A
Cyclospora	13	0.03	N/A
Surveillance population (millions)	45.50		

*Per 100,000 population
†Healthy People 2010 objectives for incidence of *Campylobacter, Salmonella*, and Shiga toxin-producing *Escherichia coli* O157 infections for year 2010 and for incidence of *Listeria* infections for years 2005 and 2010
§Not applicable because no national health objective exists for this pathogen
¶Shiga toxin-producing *Escherichia coli*.

*Summary of "Preliminary FoodNet Data on the Incidence of Infection with Pathogens Transmitted Commonly Through Food—10 States, United States, 2007" published in the Morbidity and Mortality Weekly Report (MMWR) on April 11, 2008.

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Spotlight on Negative Binomial Regression Model

During 1996 to 2007, the FoodNet surveillance population increased from 14.2 million persons in five sites to 45.5 million persons in ten sites. These changes, along with the variation in incidence of infections seen among sites, provide challenges in monitoring changes in the incidence of infection over time. To account for these sources of variation, FoodNet uses a main-effects, log-linear Poisson regression model called the negative binomial. This model has been used in FoodNet to compare current year data to the average annual incidence for 1996-1998 (1997-1998 for *Cryptosporidium* and *Cyclospora*). In 2008, we used the model to compare current year data with an average of the previous three years (2004-2006).

A Poisson regression model is typically used to model rates. However, this model assumes that the mean and variance are constant over time. It may be seriously biased if rates vary widely from year to year, as may be the case given the consistent growth of the FoodNet catchment area. The negative binomial model is an extension of the Poisson regression model in that it allows for the variability in rates by location and year. The model calculates the estimated change in incidence (relative rate) between 2007 and the comparison periods along with 95% confidence intervals.

By monitoring the burden of foodborne diseases over time using a negative binomial model, FoodNet is able to estimate statistically significant changes in the incidence of pathogens, which contributes to efforts to document the effectiveness of new food safety initiatives in decreasing the burden of foodborne diseases in the United States.

— Olga Henao, CDC FoodNet

WHAT IS FOODNET?

The Foodborne Diseases Active Surveillance Network (FoodNet) is the principal foodborne disease component of CDC's Emerging Infections Program. FoodNet is a collaborative project of the CDC, ten sites (CA, CO, CT, GA, MD, MN, NM, NY, OR, TN), the U. S. Department of Agriculture (USDA), and the Food and Drug Administration (FDA). The CDC FoodNet Team is in the Enteric Diseases Epidemiology Branch (EDEB), in the Division of Foodborne, Bacterial, & Mycotic Diseases (DFBMD) in the National Center for Zoonotic, Vector-Borne, & Enteric Diseases (NCZVED).

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FDA Proposes Food Protection Plan

American consumers have one of the safest food supplies in the world, yet CDC estimates that 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths occur in the U.S. each year due to foodborne pathogens[1]. In 2006, spinach contaminated with *E.coli* 0157 caused 199 illnesses, 102 hospitalizations, and 3 deaths[2] and in 2007, peanut butter contaminated with S.Tennessee lead to 425 illnesses and 71 hospitalizations[3]. The risks aren't just to humans but to our pets as well. Last year, pet food contaminated with melamine caused kidney failure and death to cats and dogs, resulting in a recall of over 100 brands of pet food[4]. In each of these cases the Food and Drug Administration (FDA) worked diligently and swiftly to alert the American consumer, trace the problem to its source, and remove the affected products from market shelves.

FDA's goal is to prevent foodborne illness from occurring. Each year there are a greater variety of foods available, advances in production and distribution methods, and a growing volume of imports. To keep consumers safe from unintentional and deliberate contamination of the food supply, one must adapt to these changes and adopt a new approach to food safety. In November 2007 FDA took the first step down this road when it unveiled its Food Protection Plan. This plan utilizes a set of integrated strategies that focus on risks over a product's life cycle from production to consumption, target resources to achieve maximum risk reduction, and use science and modern technology systems.

The plan encompasses three core elements: prevention, intervention and response. *Prevention* involves promoting increased corporate responsibility to ensure food problems do not occur in the first place. By comprehensively reviewing food supply vulnerabilities and developing and implementing risk reduction measures with industry and other stakeholders, FDA can address critical weaknesses. *Intervention* focuses on risk-based inspections, sampling, and surveillance at high risk points in the food supply chain. These interventions must verify that preventive measures are in fact being implemented correctly. *Response* refers to bolstering FDA's emergency response efforts allowing for increased speed and efficiency. It also stresses better communication with federal, state, and local government agencies and industry during and after emergencies. Whether contamination is unintentional or deliberate, there is a need to respond quickly and to communicate clearly with consumers and other stakeholders. Communication should emphasize identifying products of concern as well as educating the public on what is safe to consume.

FDA recognizes the need to partner with Congress to make the changes to transform the safety of the nation's food supply. The plan identifies administrative actions the Agency is proposing to take and recommends legislative changes to strengthen FDA's ability to protect Americans from foodborne illnesses. The proposed changes include:

- allowing FDA to require preventive controls to prevent intentional adulteration by terrorists or criminals at points of high vulnerability in the food chain
- authorizing FDA to issue additional preventive controls for high-risk foods
- requiring food facilities to renew their FDA registrations every two years, and allowing FDA to modify the registration categories
- authorizing FDA to accredit highly qualified third parties for voluntary food inspections
- require new re-inspection fee from facilities that fail to meet current good manufacturing practices
- authorize FDA to require electronic import certificates for shipments of designated high-risk products
- require new food and animal feed export certification fee to improve the ability of U.S. firms to export their products
- provide parity between domestic and imported foods if FDA inspection access is delayed, limited, or denied

Details on the Food Protection Plan can be found at www.fda.gov/oc/initiatives/advance/food.html.

—Sebastian Cianci and Jack Guzewich, FDA

[1] Mead, P. S., L. Slutsker, V. Dietz, L. F. McCaig, J. S. Bresee, C. Shapiro, P. M. Griffin & R. V. Tauxe. Food-related illness and death in the United States. Emerging Infectious Diseases. 1999:5, 607-625.

[2] http://www.cdc.gov/foodborne/ecolispinach/100606.htm

[3] http://www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis_2007/030707_outbreak_notice.htm

[4] http://www.fda.gov/oc/opacom/hottopics/petfood.html

USDA Rises to Food Safety Challenges in 2008

The food safety world has faced significant challenges during the last year and the U.S. Department of Agriculture's (USDA) Food Safety and Inspection Service (FSIS) has risen to the challenges of combating foodborne pathogens. With the ongoing challenge of combating *E. coli* 0157:H7, *Salmonella* and other pathogens, FSIS and its stakeholders are aggressively identifying and implementing strategies to reduce these food-related public health hazards.

Not all food products are equal from a risk standpoint. Higher risk products and processes would appear to warrant a higher level of effort to ensure measures are in place and put into action to control pathogens, lowering the likelihood of foodborne illness. Development of a new approach to inspection based on public health and risk is needed. This would be a uniform, consistent process (1) to determine when and where inspection is warranted, (2) based on the inherent risk of the product and a plant's demonstrated control of that risk, and (3) when and where audits are sufficient.

An integrated information system and infrastructure is necessary to support a robust, risk-based inspection system. FSIS is well on its way to strengthening and enhancing its data infrastructure. The Public Health Information System, planned to launch in late 2009, is a Web-based system that will make FSIS data collection, analysis and reporting more efficient, allowing FSIS to better protect public health, address humane handling concerns and ensure food defense.

Other areas where FSIS is enhancing how it protects public health, in which FoodNet participants are highly involved, are epidemiological investigations and the recall process.

—Article continued on page 3.

Cont'd: USDA Rises to Food Safety Challenges in 2008

Since the increase of *E. coli O157* related recalls in 2007, FSIS now takes into account a broader, more complete range of evidence when evaluating whether to seek a recall or take regulatory action. This provides a credible approach for taking action more rapidly based on evidence available at the time. FSIS has acted upon epidemiological evidence in some cases that linked illness to opened, or non-intact, product found in consumers' freezers. These recalls would not have been carried out under the old policies.

And to improve how the agency works with stakeholders and supports partners during investigations and recalls and in fighting *E. coli* O157:H7, FSIS is holding two meetings to get input from stakeholders and partners. On April 9 and 10, FSIS sponsored a public meeting focused combating *E. coli* O157:H7. Scheduled topics included recent spikes in the number of product testing positive and recalls with illnesses related to *E. coli* O157:H7, updates on FSIS initiatives and building a foundation for solutions to address the challenges. On May 15 and 16, 2008, FSIS, with FDA and CDC, is co-sponsoring a meeting in St. Louis followed by a meeting with partners involved in recalls and investigations to identify challenges to effective communication and coordination, and work toward potential solutions.

In 2008, FSIS is continuing with other recent and ongoing actions against pathogens such as *E. coli* O157:H7 and *Salmonella.* Expanded testing for domestic and imported ground beef components is one of many new *E. coli* programs announced in Fall 2007.

On March 28, FSIS began posting on its Web site the test results of individual broiler plants that are not in the best performing category for *Salmonella* control. This is part of an 11-point, risk-based strategy for *Salmonella* reduction in raw products first announced in February 2006. Since then, the percentage of plants placed in the best-performing category more than doubled from 35 percent to 74 percent.

Learn more about FSIS initiatives at www.fsis.usda.gov.

—Laura Reiser and Janice Adams-King, USDA-FSIS

Cryptosporidium Conundrum: A Surge in Cryptosporidiosis Cases Leaves Us with More Questions than Answers

In 2007, an unprecedented number of cryptosporidiosis cases were reported to CDC, primarily during the spring and summer months. Provisional data received by CDC show that >10,000 laboratory-confirmed cases were reported by states, New York City, and the District of Columbia in 2007, nearly double the number of cases reported in 2006[1]. Preliminary reports of 19 outbreaks comprising a total of 612 cases were received from 11 states; 18 (95%) of those outbreaks were associated with recreational water. Additionally, >15 outbreaks of cryptosporidiosis were investigated by state or local public health departments and publicized in the local news media but have not yet been officially reported to CDC.

One possible explanation for the huge increase in reported cases in 2007 is that physicians are diagnosing the disease more often now that there is an FDA-approved drug available to treat it. Nitazoxanide was approved for use in children aged 1-11 years in 2002 and for children 12 and older and adults in 2005; it is the first and only drug approved for treatment of diarrhea due to cryptosporidiosis in the United States. Another explanation could be that increased use of rapid diagnostic tests for *Cryptosporidium* is leading to identification of more infections because these methods allow for faster and easier diagnosis of infection. Finally, the increase may be a result of a true increase in the number of *Cryptosporidium* infections in the United States. No single event seems to provide a satisfactory explanation for the dramatic increase in reported cases, but rather the increase is likely due to a combination of these or other events.

Despite the large numbers of cryptosporidiosis cases that continue to be reported, there is little molecular epidemiologic data on specimens from sporadic cases, in contrast to specimens from numerous outbreaks which have been characterized. As a result, the transmission dynamics of cryptosporidiosis in the general community is not well understood in the United States. Molecular characterization performed at CDC on sporadic cases from four states in 2007 showed a predominance of *C. hominis* with minor genetic diversity. This work was limited by the fact that many stool samples sent to CDC were stored in formalin, a preservative that makes DNA-based characterization difficult.

Testing at the Minnesota Public Health Laboratory, which has been typing *Cryptosporidium* since 2002, demonstrates that the cases are increasing in that state, and that an increasing proportion of reported cases are *C. hominis* rather than *C. parvum*. This change in species distribution seems to indicate an increase of human-to-human transmission of *Cryptosporidium* relative to zoonotic transmission, a trend also seen in the United Kingdom[2].

Standardized *Cryptosporidium* typing has the potential to enhance our knowledge of the epidemiology of *Cryptosporidium* infection in the United States. There is a clear need for laboratory-based surveillance at the national level; therefore CDC has proposed a linked molecular surveillance database system tentatively called CryptoNet, which will build on the PulseNet platform. The purpose of CryptoNet is to establish a timely, linked laboratory database system to help detect clusters and investigate outbreaks. *Cryptosporidium* typing data from individual specimens will be entered and shared by public health laboratories. These shared data will permit a better understanding of the transmission dynamics of cryptosporidiosis, differentiation of outbreaks from sporadic cases, prompt detection of common source and multi-state outbreaks, and identification of environmental sources of infection.

- Rebecca Hall and Jonathan Yoder, CDC Division of Parasitic Diseases

[1] *Notifiable weekly information*. MMWR, 2008. 56(52): p. 1360-1371.

[2] Sopwith, W., et al., *The changing epidemiology of cryptosporidiosis in North West England*. Epidemiol Infect, 2005. 133(5): p. 785-93.

FoodNet Vision Meeting 2008

FoodNet held its annual Vision Meeting in Denver, Colorado on March 6-7, 2008. The purpose of the meeting was to review progress on current activities and set goals for the upcoming year. Priorities for 2008 centered on FoodNet's main objectives of burden, trends, attribution, and interventions. Goals included: publishing revised burden of disease estimates, creating the population survey 5th cycle atlas of exposure, continuing work to adapt the Danish attribution model to FoodNet data, evaluating trends in STEC following changing laboratory practices, standardizing STEC interview questions between sites, improving the quality of *Campylobacter* speciation data, analyzing results from the recently completed case-control study of S. Javiana, S. Infantis and S. I 4,5,12:i:- infections and a cohort study of resistant *Salmonella* infections, developing a PFGE cluster evaluation supplemental form, developing a facts and figures website and implementing surveillance for *C.difficile* in selected sites. The group will continue to enroll cases into the *E.coli* O157 cohort study and genomics substudy. Finally, the group will revise FoodNet's fourth objective to focus on dissemination of data rather than development of interventions and informing public health practice.

The Vision Meeting was preceded by a full day meeting of site coordinators and half day meeting of principal investigators.

—Mary Patrick, CDC FoodNet

RECENTLY PRESENTED ABSTRACTS AT ICEID (INTERNATIONAL CONFERENCE ON EMERGING INFECTIOUS DISEASES) 2008

- Gould, L. H. et al. Epidemiology of non-O157 Shiga toxin-producing *E. coli* in FoodNet sites, 2000-2006.
- Hoefer, D. et al. *E.coli* O157 and non-O157 Shiga toxin-producing *E.coli* (STEC) testing among laboratories serving the FoodNet catchment area.
- Hurd, S. et al. Analysis of *Listeria* Case Report Forms Among Non-Pregnant Cases: FoodNet Sites, 2004-2006.
- Long, C. et al. Trends in incidence of frequently identified non-typhoidal *Salmonella* serotypes, Foodborne Diseases Active Surveillance Network 1996-2006.
- Moyer, L. et al. Human Health Burden of Acute Diarrheal Illness in the United States, FoodNet Population Survey, 2006-2007.
- Ong, K.L. et al. International Travel Associated Salmonellosis: Foodborne Diseases Active Surveillance Network (FoodNet) 2004-2006.
- Ou, J. et al. The Prevalence of Reactive Arthritis Symptoms in the General Population, FoodNet Population Survey, 2006-2007.
- Shiferaw, B. et al. Are there gender differences in food consumption? The FoodNet Population Survey, 2006-2007.
- Tobin-D'Angelo, M. et al. Description of Shiga toxin-producing *E. coli* infections in Georgia.

RECENTLY PUBLISHED MANUSCRIPTS

- Crump, J. et al. Clinical response and outcome of infection with *Salmonella* Typhi with decreased susceptibility to fluroquinolones: a United States FoodNet multi-center retrospective cohort study. Antimicrob Agents Chemother; 2008. Vol 52: 1278-84.
- Marcus, R. et al. New Information about Pediatric Foodborne Infections-the view from FoodNet. Curr Opin Pediatr; 2008. Vol 20: 79-84.
- Nelson, J. et al. FoodNet Survey of Food Use and Practices in Long-Term Care Facilities. J Food Prot; 2008. Vol 71 (2): 365-372(8)
- Townes, J. et al. Reactive arthritis following culture-confirmed infections with bacterial enteric pathogens in Minnesota and Oregon: a population-based study. Ann of Rheum Dis Published Online First: 13 February 2008.

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